

WHAT IS CLAIMED IS:

- 1 1. A compound comprising
2 a powder comprising an additive system comprising at least one sterically hindered
3 phenol antioxidant; and,
4 an organic processing agent comprising at least one friability reduction agent.
- 1 2. The compound of claim 1, wherein said friability reduction agent is an
2 alcohol.
- 1 3. The compound of claim 2, wherein said alcohol comprises a composition of
2 the formula ROH wherein R is an alkyl group of from 1 to 8 carbon atoms.
- 1 4. The compound of claim 2, wherein said alcohol is selected from the group
2 consisting of methanol, ethanol, isopropanol, and a combination thereof.
- 1 5. The compound of claim 2, wherein said alcohol comprises methanol and said
2 organic processing agent further comprises methylethylketone.
- 1 6. A compound consisting essentially of one or more dried granules consisting
2 essentially of an additive system comprising at least one primarily crystalline sterically
3 hindered phenol.

1 7. The compound of claim 6 wherein said dried granules comprise pellets
2 comprising a balanced hardness of at least about 5 lb/in.

1 8. The compound of claim 7 wherein said pellets comprise at least about 1 wt.%
2 of an essentially amorphous phase comprising said sterically hindered phenol.

1 9. The compound of claim 7 wherein said pellets comprise from about 1 wt.%
2 to about 5 wt.% of said essentially amorphous phase comprising said sterically hindered
3 phenol.

1 10. The compound of claim 7 wherein said balanced hardness is from about 10
2 lb/in to about 27 lb/in., based on measurements made using 3 mm diameter pellets.

1 11. The compound of claim 9 wherein said balanced hardness is from about 10
2 lb/in to about 27 lb/in., based on measurements made using 3 mm diameter pellets.

1 12. The compound of claim 7 wherein said balanced hardness is of from about
2 15 lb/in to about 25 lb/in., based on measurements made using 3 mm diameter pellets.

PATENT

ALB.L.3
AN-7075A

1 13. The compound of claim 9 wherein said balanced hardness is of from about
2 15 lb/in to about 25 lb/in., based on measurements made using 3 mm diameter pellets.

1 14. The compound of claim 1 wherein said at least one sterically hindered phenol
2 antioxidant has a melting point of from about 50°C or greater.

1 15. The compound of claim 6 wherein said at least one sterically hindered phenol
2 antioxidant has a melting point of from about 50°C or greater.

1 16. The compound of claim 1 wherein said at least one sterically hindered phenol
2 has a melting point of from about 95°C or greater.

1 17. The compound of claim 2 wherein said at least one sterically hindered phenol
2 has a melting point of from about 95°C or greater.

1 18. The compound of claim 3 wherein said sterically hindered phenol has a
2 melting point of from about 95°C or greater.

1 19. The compound of claim 4 wherein said at least one sterically hindered phenol
2 has a melting point of from about 95°C or greater.

1 20. The compound of claim 6 wherein said at least one sterically hindered phenol
2 has a melting point of from about 95°C or greater.

1 21. The compound of claim 7 wherein said sterically hindered phenol has a
2 melting point of from about 95°C or greater.

1 22. The compound of claim 8 wherein said at least one sterically hindered phenol
2 has a melting point of from about 95°C or greater.

1 23. The compound of claim 9 wherein said at least one sterically hindered phenol
2 has a melting point of from about 95°C or greater.

1 24. The compound of claim 7 wherein said pellets comprise a loose bulk density
2 of from about 400 g/l or greater, a Hosogawa Flowability of about 70 or greater, an average
3 diameter (x) of from about 2 millimeters to about 6 millimeters, and an average length of
4 from about 1.5x to about 3x.

1 25. The compound of claim 8 comprising pellets comprising a loose bulk density
2 of from about 400 g/l or greater, a Hosogawa Flowability of about 70 or greater, an average
3 diameter (x) of from about 2 millimeters to about 6 millimeters, and an average length of
4 from about 1.5x to about 3x.

1 26. The compound of claim 9 comprising pellets comprising a loose bulk density
2 of from about 400 g/l or greater, a Hosogawa Flowability of about 70 or greater, an average
3 diameter (x) of from about 2 millimeter to about 6 millimeters, and an average length of from
4 about 1.5x to about 3x.

1 27. The compound of claim 6 comprising agglomerates comprising a loose bulk
2 density of from about 400 g/l or greater and a Hosogawa Flowability of about 70 or greater.

1 28. The compound of claim 1, wherein said sterically hindered phenol
2 antioxidant is selected from the group consisting of:
3 octadecyl 3,5-di-t-butyl-4-hydroxyhydrocinnamate;
4 tetrakis [methylene(3,5-di-t-butyl-4-hydroxyhydrocinnamate)]methane;
5 1,3,5-trimethyl-2,4,6-tris-(3,5-di-t-butyl-4-hydroxybenzyl)benzene;
6 1,3,5-tris-(3,5-di-t-butyl-4-hydroxybenzyl) isocyanurate, and,
7 1,3,5-tris-(4-t-butyl-3-hydroxy-2,6-dimethylbenzyl)-1,3,5-triazine-2,4,6-(1H,
8 3H, 5H) - trione.

1 29. The compound of claim 6, wherein said sterically hindered phenol
2 antioxidant is selected from the group consisting of:
3 octadecyl 3,5-di-t-butyl-4-hydroxyhydrocinnamate;

1 tetrakis [methylene(3,5-di-t-butyl-4-hydroxyhydrocinnamate)]methane;
2 1,3,5-trimethyl-2,4,6-tris-(3,5-di-t-butyl-4-hydroxybenzyl)benzene;
3 1,3,5-tris-(3,5-di-t-butyl-4-hydroxybenzyl) isocyanurate, and,
4 1,3,5-tris-(4-t-butyl-3-hydroxy-2,6-dimethylbenzyl)-1,3,5-triazine-2,4,6-(1H,
5 3H, 5H) - trione.

1 30. The compound of claim 1, wherein said sterically hindered phenol
2 antioxidant is selected from the group consisting of:
3 1,3,5-trimethyl-2,4,6-tris-(3,5-di-t-butyl-4-hydroxybenzyl)benzene;
4 1,3,5-tris-(3,5-di-t-butyl-4-hydroxybenzyl) isocyanurate.

1 31. The compound of claim 6, wherein said sterically hindered phenol
2 antioxidant is selected from the group consisting of:
3 1,3,5-trimethyl-2,4,6-tris-(3,5-di-t-butyl-4-hydroxybenzyl)benzene;
4 1,3,5-tris-(3,5-di-t-butyl-4-hydroxybenzyl) isocyanurate.

1 32. A compound comprising one or more dried granules made by a process
2 comprising:
3 mixing an organic processing agent comprising a friability
4 reduction agent with a powder comprising an additive
5 system comprising at least a first sterically hindered

6 phenol antioxidant under conditions that are effective
7 to form a paste;
8 processing said paste to form said one or more granules; and,
9 exposing said one or more granules to conditions that are effective to remove
10 said organic processing agent from said one or more granules but
11 ineffective to melt said sterically hindered phenol antioxidant.

1 33. The compound of claim 32 wherein said friability reduction agent comprises
2 an alcohol.

1 34. The compound of claim 33, wherein said alcohol comprises a composition
2 of the formula ROH wherein R is an alkyl group of from 1 to 8 carbon atoms.

1 35. The compound of claim 32, wherein said alcohol is selected from the group
2 consisting of methanol, ethanol, and isopropanol.

1 36. A process for manufacturing granules comprising:
2 mixing an organic processing agent comprising an amount of
3 a friability reduction agent with a powder comprising
4 an additive system comprising at least a first sterically

5 hindered phenol antioxidant under conditions that are
6 effective to form a paste;
7 processing said paste to form said one or more granules; and,
8 exposing said granules to conditions that are effective to remove said organic
9 processing agent from said granules but ineffective to melt said
10 sterically hindered phenol antioxidant, thereby producing said one or
11 more dried granules.

1 37. The process of claim 36 further comprising controlling balanced hardness of
2 said granules by adjusting said amount of said friability reduction agent.

1 38. The process of claim 36, wherein said friability reduction agent is an alcohol.

1 39. The process of claim 37, wherein said friability reduction agent is an alcohol.

1 40. The process of claim 39, wherein said alcohol comprises a composition of the
2 formula ROH wherein R is an alkyl group of from 1 to 8 carbon atoms.

1 41. The process of claim 39, wherein said alcohol is selected from the group
2 consisting of methanol, ethanol, and isopropanol.

PATENT

ALB.L.3
AN-7075A

1 42. One or more granules consisting essentially of at least one primarily
2 crystalline sterically hindered phenol antioxidant having a melting point of from about 50°C
3 or greater.

1 43. One or more granules consisting essentially of at least one primarily
2 crystalline sterically hindered phenol antioxidant having a melting point of from about 95°C
3 or greater.

1 44. The granules of claim 42 comprising at least 20 wt.% of said at least one
2 sterically hindered phenol antioxidant.

1 45. The granules of claim 43 comprising at least 20 wt.% of said at least one
2 sterically hindered phenol antioxidant.

1 46. The granules of claim 42 having a balanced hardness.

1 47. The granules of claim 43 having a balanced hardness.

1 48. The granules of claim 44 having a balanced hardness.

1 49. The granules of claim 45 having a balanced hardness.

1 50. The granules of claim 48 comprising a loose bulk density of from about 400
2 g/l or greater, an average diameter (x) of from about 1 millimeters to about 10 millimeters,
3 and, where the granules are pellets, an aspect ratio of from about 1 to about 5.

51. The granules of claim 49 comprising a loose bulk density of from about 400 g/l or greater, an average diameter (x) of from about 1 millimeters to about 10 millimeters, and, where the granules are pellets, an aspect ratio of from about 1 to about 5.

1 53. The granules of claim 50 wherein said length is from about 1 to about 5
2 millimeters.

1 54. The granules of claim 51 wherein said length is from about 1 to about 5
2 millimeters.

1 55. The granules of claim 49 wherein said sterically hindered phenol antioxidant

2 is selected from the group consisting of:

3 octadecyl 3,5-di-*t*-butyl-4-hydroxyhydrocinnamate;

4 tetrakis [methylene(3,5-di-*t*-butyl-4-hydroxylhydrocinnamate)] methane;

5 1,3,5-trimethyl-2,4,6-tris-(3,5-di-t-butyl-4-hydroxybenzyl)benzene;

6 1,3,5-tris-(3,5-di-t-butyl-4-hydroxybenzyl) isocyanurate, and,

7 1,3,5-tris-(4-t-butyl-3-hydroxy-2,6-dimethylbenzyl)-1,3,5-triazine-2,4,6-(1H, 3H,
8 5H) - trione; and,
9 thiodiethylenebis-(3,5,-di-t-butyl-4-hydroxy) hydrocinnamate.

1 56. The granules of claim 49 wherein said sterically hindered phenol antioxidant
2 is selected from the group consisting of:

3 tetrakis [methylene(3,5-di-t-butyl-4-hydroxylhydrocinnamate)] methane;
4 1,3,5-trimethyl-2,4,6-tris-(3,5-di-t-butyl-4-hydroxybenzyl)benzene;
5 1,3,5-tris-(3,5-di-t-butyl-4-hydroxybenzyl) isocyanurate, and,
6 1,3,5-tris-(4-t-butyl-3-hydroxy-2,6-dimethylbenzyl)-1,3,5-triazine-2,4,6-(1H, 3H,
7 5H) - trione; and,
8 thiodiethylenebis-(3,5,-di-t-butyl-4-hydroxy) hydrocinnamate.

1 57. The granules of claim 49 wherein said sterically hindered phenol antioxidant
2 is 1,3,5-trimethyl-2,4,6-tris-(3,5-di-t-butyl-4-hydroxybenzyl)benzene.

1 58. The granules of claim 42 wherein said at least one antioxidant comprises from
2 about 0 to about 80 wt.% of a secondary phosphite antioxidant.

1 59. The granules of claim 43 wherein said at least one antioxidant comprises from
2 about 0 to about 80 wt.% of a secondary phosphite antioxidant.

1 60. The granules of claim 44 wherein said at least one antioxidant comprises from
2 about 0 to about 80 wt.% of a secondary phosphite antioxidant.

1 61. The granules of claim 45 wherein said at least one antioxidant comprises from
2 about 0 to about 80 wt.% of a secondary phosphite antioxidant.

1 62. The granules of any of claims 48 wherein said at least one antioxidant
2 comprises from about 0 to about 80 wt.% of a secondary phosphite antioxidant.

1 63. The granules of any of claims 49 wherein said at least one antioxidant
2 comprises from about 0 to about 80 wt.% of a secondary phosphite antioxidant.

1 64. The granules of claim 42 wherein said additive system comprises at least
2 about 20 wt.% of said at least one sterically hindered phenol antioxidant, and further
3 comprises a material selected from the group consisting of antistatics, antiblocking agents,
4 flame proofing agents, thioesters, pigments, UV absorbers, and light stabilizers.

1 65. The granules of claim 43 wherein said additive system comprises at least
2 about 20 wt.% of said at least one sterically hindered phenol antioxidant, and further

3 comprises a material selected from the group consisting of antistatics, antiblocking agents,
4 flame proofing agents, thioesters, pigments, UV absorbers, and light stabilizers.

1 66. The granules of claim 58 wherein said additive system comprises at least
2 about 20 wt.% of said at least one sterically hindered phenol antioxidant, and further
3 comprises a material selected from the group consisting of antistatics, antiblocking agents,
4 flame proofing agents, thioesters, pigments, UV absorbers, and light stabilizers.

1 67. The granules of claim 59 wherein said additive system comprises at least
2 about 20 wt.% of said at least one sterically hindered phenol antioxidant, and further
3 comprises a material selected from the group consisting of antistatics, antiblocking agents,
4 flame proofing agents, thioesters, pigments, UV absorbers, and light stabilizers.

1 68. The granules of any of claim 66 further comprising a material selected from
2 the group consisting of an internal lubricant, an external lubricant, an acid neutralizer, and
3 a metal soap, .

1 69. The granules of any of claim 67 further comprising a material selected from
2 the group consisting of an internal lubricant, an external lubricant, an acid neutralizer, and
3 a metal soap, .

PATENT

ALB.L.3
AN-7075A

1 70. A compound according to claim 1 substantially as described herein in any of
2 the examples.

1 71. A compound according to claim 6 substantially as described herein in any of
2 the examples.

1 72. A compound made according to the process of claim 36.

1 73. A compound made according to the process of claim 37.

1 74. Granules made according to the process of claim 42.

1 75. Granules made according to the process of claim 43.